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**FEBURARY**

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## Cuspal deflection in molars in relation to endodontic and restorative procedures

*Panitvisai P, Messer HH. Cuspal deflection in molars in relation to endodontic and restorative procedures. J Endodon 1995; 21:57-61.*

**PURPOSE:** To measure cuspal deflection of extracted mandibular molars in response to endodontic and restorative procedures.

**M&M:** Twelve intact mandibular molars (mainly third molars) were mounted in acrylic to a level 2 mm below the CEJ. The teeth were placed on a servohydraulic testing machine and cuspal deflection of each cusp was measured under load using direct current differential transformers. The teeth were divided into two groups of 6 or 7 teeth each. In group 1 progressively larger MO cavity preparations were made followed by endodontic access preparation. In group 2 MOD cavity preparations were made followed by endodontic access preparation. After each subsequent preparation cuspal deflection was measured.

**RESULTS:** Endodontic access in both groups led to a 2- to 3-fold increase in cuspal movement which was greater in the MOD group than the MO group. Cuspal deflection in the MOD group was greater than in the MO group.

**C&C:** Reeh had previously shown only a 5% change in cuspal stiffness with endodontic access alone. However, this study found a large 2- to 3-fold increase in cuspal movement after endodontic access preparations with existing MO and MOD cavity preparations. Cuspal movement may lead to increased chance for microleakage and cuspal fracture. This study is further support for full coverage restorations for endodontically treated molars.

**February 1995**  
**ACLS - MAYBE**

**Martin Gambill**

## Ability of bacterial endotoxin to diffuse through human dentin

*Nissan R, Segal H, Pashley D, Stevens R, Trowbridge H. Ability of bacterial endotoxin to diffuse through human dentin. J Endodon 1995;21:62-4.*

**PURPOSE:** To determine whether endotoxin is capable of permeating a thicker layer of dentin by diffusion in the absence of filtration pressure, and if so to determine the quantity of endotoxin passing across dentin during a 24-h period.

**M&M:** Five human impacted, immature third molars were extracted, the roots were removed, and a class I cavity preparation was prepared in the occlusal surface such that about 0.5 mm of dentin remained between the pulp chamber roof and the cavity preparation floor. Both surfaces were etched to remove the smear layer. The occlusal chamber was filled with a known quantity of endotoxin. Samples were drawn from the pulp chamber after 15 and 30 min and again at 30-min intervals up to 5 h. A final sample was collected at 24 h. The amount of endotoxin passing through the dentin was determined.

**RESULTS:** The initial appearance of endotoxin in the pulpal chambers of four of the five specimens ranged from 15 min to 4.5 h. The concentration of endotoxin collected varied considerably.

**C&C:** The high molecular weight of endotoxin may be one determining factor in slowing the passage of endotoxin through dentin. Also, dentin may bind some endotoxin, thereby limiting its penetration. Endotoxin is one of the largest molecules released by bacteria. So, the fact that endotoxin passes through dentin suggests that all bacteria products are potentially capable of reaching and affecting the pulp.

**February 1995**

**Bruce Poulsen**

## A comparison of tissue reactions to Ketac-Fil and amalgam

*DeGroot ME, Oguntebi BR, Cunningham CJ, Pink R. A comparison of tissue reactions to Ketac-Fil and amalgam. J Endodon 1995; 21:65-69.*

**PURPOSE:** To compare the histological reactions of bone tissue to Ketac-Fil and the most commonly used retrograde filling material, amalgam, in a rat model.

**M&M:** Forty-eight Harlan rats were divided into three groups. Ketac-Fil glass ionomer material and amalgam were packed into 3 x 1 mm polyethylene tubes. In group 1 the Ketac-Fil tubes were implanted into the extraction site of the right mandibular incisor of the rats. In group 2 the amalgam filled tubes were implanted, and in group 3 empty tubes were implanted as controls. The rats were killed after 14, 42, and 90 days and the reaction to the implant materials was evaluated histologically.

**RESULTS:** There was no significant difference in PMN infiltrate between the groups. Amalgam resulted in a significant increase in lymphocyte infiltration from 14 to 42 days and from 42 to 90 days. There was a statistically significant decrease in lymphocyte infiltration from 42 to 90 days with the Ketac-Fil. There was no difference in bone formation in the groups.

**C&C:** As has been shown in previous studies (Kawahara et al., Zmener and Cabrini, and Hanks et al.), glass ionomer once again appears to be biocompatible. Some concerns for using glass ionomer cements as retrofilling materials are their poor radiopacity, sensitivity to moisture control, and potential leakage problems if not handled properly.

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**Martin Gambill**

## Bacterial invasion into dentinal tubules of human vital and nonvital teeth

*Nagaoka S, Miyazaki Y, Liu HJ, Iwamoto Y, Kitano M, Kawagoe M. Bacterial invasion into dentinal tubules of human vital and nonvital teeth. J Endodon 1995;21:70-3.*

**PURPOSE:** To clarify the effects of the dental pulp on bacterial invasion into the dentinal tubules.

**M&M:** Nineteen pairs of intact maxillary third molars were used. Root canal treatment was completed unilaterally. Class V cavity preparations were cut in all experimental teeth. The cavities were left exposed for 30 or 150 days. The teeth were extracted after either 30 or 150 days exposure. One-half of each tooth was sectioned and stained for bacteria. The other half was prepared for SEM examination. The bacterial penetration rate was determined.

**RESULTS:** For the teeth exposed to the environment for 30 days, the bacterial penetration rate was low for both vital and nonvital teeth (1.8% vs. 0.5%). There was no significant difference between the two groups. For the teeth exposed to the environment for 150 days, the bacterial invasion rate of the nonvital teeth was higher than that of the vital teeth (35.7% vs. 18.9%). The difference between these two groups was statistically significant.

**C&C:** The extent of bacterial invasion in vital teeth is lower than for nonvital teeth because the tubular diameter diminishes by the action of components (fibrinogen) in the dentinal fluid. Thus, the dentinal fluid exerts various restraining effects (outward fluid flow, antibodies) on bacterial invasion.

**February 1995**

**Bruce Poulsen**

## Leakage of amalgam and Super-EBA root-end fillings using two preparation techniques and surgical microscopy

*O'Connor RP, Hutter JW, Roahen JO. Leakage of amalgam and Super-EBA root-end fillings using two preparation techniques and surgical microscopy. J Endodon 1995; 21:74-78.*

**PURPOSE:** To compare the sealing ability of two root-end filling materials, Super-EBA and amalgam with varnish, when placed into preparations made with ultrasonics or a surgical micro-handpiece.

**M&M:** Seventy single-rooted extracted human maxillary and mandibular teeth were instrumented 1 mm short of the apical foramen and obturated with laterally condensed GP without sealer to simulate a poorly obturated canal. In groups 1 and 2 perpendicular root-end resections were done 3 mm from the apex, and root-end preparations were made with an ultrasonic system (Amadent). The preparations in group 1 were filled with Super-EBA, and the preparations in group 2 were filled with amalgam (Tytin) after applying cavity varnish (Copalite). In groups 3 and 4 beveled root-end resections at a 45 degree angle were prepared 3 mm from the apex and root-end preparations were made using a micro-handpiece. In group 3 the preparations were filled with Super-EBA, and in group 4 with amalgam and varnish. All procedures were done under a surgical microscope (Storz). The teeth were stored in saline for 4 months then coated with nail varnish (except for the cut root-end), and leakage was evaluated after suspension in methylene blue dye for 2 weeks.

**RESULTS:** Super-EBA demonstrated significantly less leakage than amalgam with varnish regardless of preparation type. There was no difference in leakage between the beveled hand-piece prepared teeth and the perpendicular ultrasonic preparations. Over 72% of all root-end fillings allowed complete penetration of the dye.

**C&C:** As shown previously by Bondra, Super-EBA leaks less than amalgam with varnish. The fact that 72% of all root-end fillings leaking completely emphasize the importance of good non-surgical preparation of the canal prior to surgery.

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Martin Gambill

## Quantitative assessment of dentin bridge formation following pulp-capping in miniature swine

*Oguntebi BR, Heaven T, Clark AE, Pink FE. Quantitative assessment of dentin bridge formation following pulp-capping in miniature swine. J Endodon 1995;21:79-82.*

**PURPOSE:** To compare the dentin bridges formed under four dissimilar pulp-capping agents.

**M&M:** Buccal class V cavity preparations with 2 mm pulp exposures were cut in 12 teeth in each of four swine. Bioglass, Life, Demineralized Dentin Matrix or Teflon was placed on the pulp exposure. A Teflon disk was laid over the capping material. The cavity was restored with IRM. Immediately after pulp-capping and after 30 and 60 days, Demeclocycline was administered to each swine. The animals were killed after 90 days. The rate of dentin bridge formation was determined by measuring the width of fluorescent bands formed. An index of the mineral density of the dentin bridge relative to the primary dentin was calculated.

**RESULTS:** There were no significant difference between the four materials in mineral density or rate of dentin bridge formation.

**C&C:** The findings in this study indicate that pulp-capping materials affect neither the rate of dentin formation nor their mineral densities.

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**Bruce Poulsen**

## Effects of Nd:YAG laser on the permeability of root canal wall dentin

*Miserendino LJ, Levy GC, Rizioiu IM. Effects of Nd:YAG laser on the permeability of root canal wall dentin. J Endodon 1995; 21:83-87.*

**PURPOSE:** To evaluate the effect of intracanal Nd:YAG laser irradiation on dentin permeability and to compare these effects to the ultrastructural appearance of the canal wall surfaces.

**M&M:** Twenty teeth were divided into 2 groups: group 1 were not laser treated and group 2 received laser treatment. Both groups were instrumented by standard step-back technique to at least a size #35 apical file. In addition, the teeth in group 2 were lased with a 300 m optical fiber with simultaneous air and water coolant spray. Three laser exposures were made for a total of 45 s/canal exposure time. The teeth were left open and then immersed in 2% methylene blue dye for 24 h, then sectioned longitudinally and dye penetration into the dentinal tubules was determined.

**RESULTS:** A reduction of dentin permeability was noted in the laser treated groups associated with the formation of a silica glass like material on the canal walls in some locations. In some areas in the laser treated group the dentin had been melted and recrystallized, but permeability into the tubules was not reduced unless formation of the glass-like material had occurred.

**C&C:** The question of whether it is beneficial to seal or open dentinal tubules prior to obturation has not been fully answered. It appears that laser systems currently available are unable to leave a consistent surface on dentin. In some areas tubules are left more permeable and in other areas they are sealed. New intelligent laser systems using automatic feedback systems may help solve this problem.

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Martin Gambill



## Root canal preparation using the second harmonic KTP:YAG laser: a thermographic and scanning electron microscopic study

*Machida T, Wilder-Smith P, Arrastia AM, Liaw LHL, Berns MW. Root canal preparation using the second harmonic KTP:YAG laser: a thermographic and scanning electron microscopic study. J Endodon 1995;21:88-91.*

**PURPOSE:** To evaluate use of the KTP:YAG laser as an adjunct to conventional endodontic techniques for removal of debris and smear layer.

**M&M:** Thirty extracted human teeth were instrumented to size #45. Eighteen teeth were prepared for temperature measurement during exposures of 1-3 W at 5 Hz for 10 s, 1 mm short of the apical foramen. Twelve teeth were exposed to the KTP:YAG laser at 1 W for 6 s, 2 W for 3 s, or 3 W for 2 s. The fiber was moved up and down slowly in the apical third. This procedure was repeated five times with 10 s cooling time between each irradiation. The teeth were sectioned longitudinally and examined under SEM.

**RESULTS:** The maximum temperature increase of 10.3 ° C was recorded during exposure at 2 W, 5 Hz, for 5 s. In general, the apical root surface temperature surface temperature increased proportionally with power and time. At the 1 W setting, the wall dentin was totally covered by a smear layer and debris at every level. At the 2 W setting, lower levels of smear level and debris were seen. At the 3 W setting, the root canal surface appeared clean and free of smear layer with a few patches of melting and fusion.

**C&C:** This study demonstrated that, in vitro, KTP laser irradiation can be used to remove debris and smear layer from root canal walls.

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**Bruce Poulsen**

## Effect of preflaring on tactile detection of the apical constriction

*Stabholz A, Rotstein I, Torabinejad M. Effect of preflaring on tactile detection of the apical constriction. J Endodon 1995; 21:92-4.*

**PURPOSE:** To compare the efficacy of "feeling" the apical constriction in flared and nonflared root canals by tactile sensation.

**M&M:** One hundred twenty root canals in adult patients were evaluated. In 68 of the root canals (group 1) flaring was not performed and a #15 or #20 file was used to detect or "feel" the apical constriction. In 52 root canals (group 2) Hedstrom files, Gates Gliden drills, and ultrasonic files were used to enlarge the canal orifices and flare the coronal aspect before "feeling" for the apical constriction. No pre-operative radiographs were used. A working length radiograph was taken and the tactically determined lengths were compared to radiographic lengths.

**RESULTS:** The ability to determine the apical constriction by tactile sensation was significantly increased in the preflared canals (75% vs. 32.3%). Files inserted in preflared canals had a significantly lower incidence of overextension than those in the nonflared canals (21% vs. 41%).

**C&C:** Many canal constrictions occur coronally, and early preflaring of the canal may improve our ability to instrument canals quickly.

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Martin Gambill

*Arens DE. An alternative treatment for the severely resorbed maxillary lateral incisor: a sequela of ectopic eruption. J Endodon 1995;21:95-100.*

**DISCUSSION:** These case reports described successful treatment for extensively resorbed maxillary lateral incisors using endodontic implants in early teenagers. In both cases, the maxillary lateral incisor was resorbed by the eruption of the maxillary canine. By placing the endodontic implant, these compromised lateral incisors were maintained in a functional state.

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